CLAIMS

What is claimed is:

1. A method for producing sophorolipids having spermicidal and/or antiviral properties comprising the steps of:

a. synthesizing the sophorolipid by fermentation of *Candida bombicola* in a fermentation media to form a natural mixture of lactonic sophorolipids and non-lactonic sophorolipids;

b. utilizing the natural mixture as a spermicidal and/or antiviral agent;

c. separating the lactonic sophorolipids from the natural mixture to form a lactonic fraction and mixing all remaining fractions to form a non-lactonic fraction;

d. utilizing the lactonic fraction as an spermicidal and/or antiviral agent; and

e. utilizing the non-lactonic fraction as a spermicidal and/or antiviral agent.

2. A method for producing sophorolipids having spermicidal and/or antiviral properties comprising the steps of:

a. synthesizing the sophorolipid by fermentation of *Candida bombicola* in a fermentation media to form a natural mixture of lactonic sophorolipids and non-lactonic sophorolipids; and

b. utilizing the natural mixture as a spermicidal and/or antiviral agent.

3. A method for producing sophorolipids having spermicidal and/or antiviral properties comprising the steps of:

a. synthesizing the sophorolipid by fermentation of *Candida bombicola* in a fermentation media to form a natural mixture of lactonic sophorolipids and non-lactonic sophorolipids;

b. separating the lactonic sophorolipids from the natural mixture to form a lactonic fraction and mixing all remaining fractions to form a non-lactonic fraction; and

c. utilizing the lactonic fraction as an spermicidal and/or antiviral agent.

4. A method for producing sophorolipids having spermicidal and/or antiviral properties comprising the steps of:

a. synthesizing the sophorolipid by fermentation of *Candida bombicola* in a fermentation media to form a natural mixture of lactonic sophorolipids and non-lactonic sophorolipids;

b. separating the lactonic sophorolipids from the natural mixture to form a lactonic fraction and mixing all remaining fractions to form a non-lactonic fraction; and

c. utilizing the non-lactonic fraction as an spermicidal and/or antiviral agent.

5. The method as claimed in Claim 1, wherein the sophorolipid is 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based.

6. The method as claimed in Claim 5, wherein the 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is selected from the group consisting of 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

7. The method as claimed in Claim 2, wherein the sophorolipid is 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based.

8. The method as claimed in Claim 7, wherein the 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is selected from the group consisting of 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

9. The method as claimed in Claim 3, wherein the sophorolipid is 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based.

10. The method as claimed in Claim 9, wherein the 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is selected from the group consisting of 17-L-[(2′-O-β-D-glucopyranosyl-β-D-

glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

11. The method as claimed in Claim 4, wherein the sophorolipid is 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based.

12. The method as claimed in Claim 11, wherein the 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is selected from the group consisting of 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

13. A method for inactivating spermatozoa using 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipids.

14. The method as claimed in Claim 13, wherein the 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is selected from the group consisting of 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

15. A method for neutralizing or inactivating viruses using 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipids.

16. The method as claimed in Claim 15, wherein the 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is selected from the group consisting of 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

17. A method for neutralizing or inactivating HIV using 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipids.

18. The method as claimed in Claim 17, wherein the 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is selected from the group consisting of 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[(2'-O-β-D glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

19. A sophorolipid compound having the formula 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate.

20. The sophorolipid compound as claimed in Claim 19 having spermicidal properties.

21. The sophorolipid compound as claimed in Claim 19 having antiviral properties.

22. A sophorolipid compound having the formula Ethyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

23. The sophorolipid compound as claimed in Claim 22 having spermicidal properties.

24. The sophorolipid compound as claimed in Claim 22 having antiviral properties.

25. A sophorolipid compound having the formula Hexyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

26. The sophorolipid compound as claimed in Claim 25 having spermicidal properties.

27. The sophorolipid compound as claimed in Claim 25 having anti-viral properties.

28. The method as claimed in Claim 1, wherein the sophorolipid compound is delivered in a form selected from the group consisting of a gel, a film, a foam, a suppository, a pessary, a liposomic formulation, and as a liquid imbibed in a sponge.

29. The method as claimed in Claim 2, wherein the sophorolipid compound is delivered in a form selected from the group consisting of a gel, a film, a foam, a suppository, a pessary, a liposomic formulation, and as a liquid imbibed in a sponge.

30. The method as claimed in Claim 3, wherein the sophorolipid compound is delivered in a form selected from the group consisting of a gel, a film, a foam, a suppository, a pessary, a liposomic formulation, and as a liquid imbibed in a sponge.

31. The method as claimed in Claim 4, wherein the sophorolipid compound is delivered in a form selected from the group consisting of a gel, a film, a foam, a suppository, a pessary, a liposomic formulation, as a liquid imbibed in a sponge, and as a liquid being released from an intravaginal or intrauterine delivery system.

32. The sophorolipid compound as claimed in Claim 19, wherein the sophorolipid compound is in a form selected from the group consisting of a gel, a film, a foam, a suppository, a pessary, a liposomic formulation, as a liquid imbibed in a sponge, and as a liquid being released from an intravaginal or intrauterine delivery system.

33. The sophorolipid compound as claimed in Claim 20, wherein the sophorolipid compound is delivered in a form selected from the group consisting of a gel, a film, a foam, a suppository, and a pessary.

34. The sophorolipid compound as claimed in Claim 21, wherein the sophorolipid compound is delivered in a form selected from the group consisting of a liposomic formulation, as a liquid imbibed in a sponge, and as a liquid being released from an intravaginal or intrauterine delivery system.

35. The sophorolipid compound as claimed in Claim 23, wherein the sophorolipid compound is delivered in a form selected from the group consisting of a gel, a film, a foam, a suppository, and a pessary.

36. The sophorolipid compound as claimed in Claim 24, wherein the sophorolipid compound is delivered in a form selected from the group consisting of a liposomic formulation, as a liquid imbibed in a sponge, and as a liquid being released from an intravaginal or intrauterine delivery system.

37. The sophorolipid compound as claimed in Claim 26, wherein the sophorolipid compound is delivered in a form selected from the group consisting of a gel, a film, a foam, a suppository, and a pessary.

38. The sophorolipid compound as claimed in Claim 27, wherein the sophorolipid compound is delivered in a form selected from the group consisting of a

liposomic formulation, as a liquid imbibed in a sponge, and as a liquid being released from an intravaginal or intrauterine delivery system.

39. The application of a sophorolipid synthesized by fermentation of *Candida bombicola* in a fermentation media to form a natural mixture of lactonic sophorolipids and non-lactonic sophorolipids in combination with at least one sophorolipid selected from the group consisting of:

a. 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate;

b. Ethyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate;

c. Hexyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate; and

d. combinations thereof,

as antiviral agents.

40. The application of a sophorolipid synthesized by fermentation of *Candida bombicola* in a fermentation media to form a natural mixture of lactonic sophorolipids and non-lactonic sophorolipids in combination with at least one sophorolipid selected from the group consisting of:

a. 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate;

b. Ethyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate;

c. Hexyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate; and

d. combinations thereof,

as spermicidal agents.

41. The application of the sophorolipid as claimed in Claim 19 in combination with at least one sophorolipid selected from the group consisting of:

a. Sophorolipids synthesized by fermentation of *Candida bombicola* in a fermentation media to form a natural mixture of lactonic sophorolipids and non-lactonic sophorolipids;
b. Ethyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate;
c. Hexyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate; and
d. combinations thereof,

as antiviral agents.

42. The application of the sophorolipid as claimed in Claim 19 in combination with at least one sophorolipid selected from the group consisting of:

a. Sophorolipid synthesized by fermentation of *Candida bombicola* in a fermentation media to form a natural mixture of lactonic sophorolipids and non-lactonic sophorolipids;
b. Ethyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate;
c. Hexyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate; and
d. combinations thereof,

as spermicidal agents.

43. The application of the sophorolipid as claimed in Claim 22 in combination with at least one sophorolipid selected from the group consisting of:

a. Sophorolipid synthesized by fermentation of *Candida bombicola* in a fermentation media to form a natural mixture of lactonic sophorolipids and non-lactonic sophorolipids;
b. 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate;
c. Hexyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate; and
d. combinations thereof,

as antiviral agents.

44. The application of the sophorolipid as claimed in Claim 22 in combination with at least one sophorolipid selected from the group consisting of:

a. Sophorolipid synthesized by fermentation of *Candida bombicola* in a fermentation media to form a natural mixture of lactonic sophorolipids and non-lactonic sophorolipids;

b. 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate;

c. Hexyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate; and

d. combinations thereof,

as spermicidal agents.

45. The application of the sophorolipid as claimed in Claim 25 in combination with at least one sophorolipid selected from the group consisting of:

a. Sophorolipid synthesized by fermentation of *Candida bombicola* in a fermentation media to form a natural mixture of lactonic sophorolipids and non-lactonic sophorolipids;

b. 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate;

c. Ethyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate; and

d. combinations thereof,

as antiviral agents.

46. The application of the sophorolipid as claimed in Claim 25 in combination with at least one sophorolipid selected from the group consisting of:

a. Sophorolipid synthesized by fermentation of *Candida bombicola* in a fermentation media to form a natural mixture of lactonic sophorolipids and non-lactonic sophorolipids;

b. 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate;

c. Ethyl 17-L-[(2′-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate; and

d. combinations thereof,

as spermicidal agents.

47. The application of the sophorolipids as claimed in Claim 1 in combination with known antiviral agents.

48. The application of the sophorolipids as claimed in Claim 1 in combination with known spermicidal agents.

49. The application of the sophorolipids as claimed in Claim 17 in combination with known antiviral agents.

50. The application of the sophorolipids as claimed in Claim 17 in combination with known spermicidal agents.

51. The application of the sophorolipids as claimed in Claim 20 in combination with known antiviral agents.

52. The application of the sophorolipids as claimed in Claim 21 in combination with known spermicidal agents.

53. The application of the sophorolipids as claimed in Claim 23 in combination with known antiviral agents.

54. The application of the sophorolipids as claimed in Claim 24 in combination with known spermicidal agents.